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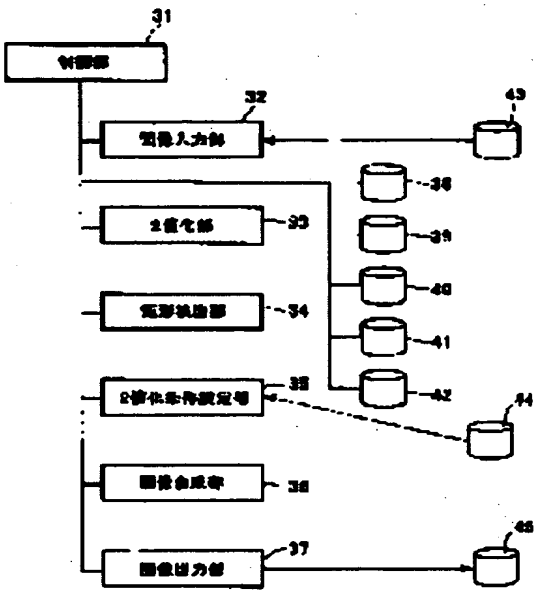
(54) IMAGE BINARY PROCESSING UNIT

(57)Abstract:
PROBLEM TO BE SOLVED: To surely apply binary processing to characters and graphics in black or in a color close to the black color by eliminating a background color from multi-color image data having the background color and including the characters and the graphics in black or in a color close to the black color.
SOLUTION: The image binary processing unit is provided with a 1st binary processing means that applies binary processing to the entire multi-color image data to generate binary image data, a means that detects a black color rectangular area being an area in a background color from the binary image data, a means that acquires luminance data of the multi-color image data with respect to the detected rectangular area, a 2nd binary processing means that obtains a binary condition on the basis of the luminance data and a binary information table, applies binary processing to the rectangular area of the multi-color image data under the binary condition and a synthesis means that synthesizes the binary image data obtained by the 1st and 2nd binary means into one image data.



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CLAIMS

[Claim(s)]
[Claim 1] In the image binary-ized approach of changing into binary image data the multi-colored picture image data which have a background color and which include the alphabetic character and graphic form of a near color black or black The 1st binary-ized means which makes binary the whole multi-colored picture image data, and creates 2 color image data, A means to detect the black rectangle field which is a field of the above-mentioned background color from this binary image data, A means to acquire the brightness data of the multi-colored picture image data to this detected rectangle field, The 2nd binary-ized means which searches for binary-ized conditions on that brightness data and a binary-ized information table, makes binary again the multi-colored picture image data which are in a black rectangle field on this binary-ized condition, and obtains 2 color image data, Image binary-ized equipment characterized by providing a synthetic means to compound 2 color image data for which it asked with the above 1st and the 2nd binary-ized means as one image data.
[Claim 2] Image binary-ized equipment according to claim 1 which makes the brightness component notation and binary-ized threshold which become the above-mentioned binary-ized information table for binary-izing as binary-ized conditions over a brightness code a brightness code and a group, and is characterized by setting up beforehand.
[Claim 3] Image binary-ized equipment according to claim 1 characterized by excepting the brightness data from average-value count when the brightness data to one or more pixels in a rectangle field are acquired first, it considers as brightness data in quest of the average value of these data in a means to acquire the brightness data of the multi-colored picture image data to the above-mentioned rectangle field and brightness data express black.
[Claim 4] In case binary-ized conditions are set up, when the brightness code which is in agreement with the acquired brightness data exists in a table with reference to the above-mentioned binary-ized information table in the binary-ized means of the above 2nd When the code which sets up the binary-ized conditions corresponding to the code, and is in agreement with a table does not exist Image binary-ized equipment according to claim 1 characterized by setting up the binary-ized conditions that perform distance count with brightness data and each code of a table etc., ask for a most similar code, and the code corresponds.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the image binary-ized equipment which removes a background color from the multi-colored picture image data which have a background color, and which include the alphabetic character and graphic form of a near color black or black, and extracts the alphabetic character and graphic form of a near color black or black.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] Color picture data are inputted into a computer from an image scanner etc., and the computer system which extracts an alphabetic character and a graphic form from this inputted color picture data is known. In this case, color picture data are inputted into a computer as multi-colored picture image data through an image scanner. Multi-colored picture image data have three color components per [R, G, and B] pixel, and each color component has 8-bit brightness data, respectively.
[0003] Such multi-colored picture image data are changed into 2 color image data, i.e., monochrome image data, if needed. Thus, it is called image binary-ization to change multi-colored picture image data into 2 color image data.
[0004] By this image binary-ized approach, the brightness data value of each pixel was compared with the threshold set up beforehand, the brightness component of 1 color component, for example, G (green) component, was extracted among R, G, and B, when a brightness data value was larger than a threshold, the pixel was changed into white, and when small, as a pixel was changed black, the image data of two monochrome colors was created.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained in full detail above, even if it is the case in which multi-colored picture image data have a background color where it consists of the alphabetic characters and graphic forms of a near color black or black according to this invention, binary-ization can remove a background color, and 2 color image data which extracted the information on an alphabetic character or a graphic form correctly can be created.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Drawing 5 is drawing showing the example of the formation of image binary.

[0006] The case where multi-colored picture image data as shown in drawing 5 (A) are changed into 2 color image data by the conventional image binary-ization is explained. The color of the rectangle background region 1 of "Yamada Taro" which was black as for the multi-colored picture image data shown in drawing 5 (A), and was drawn is G (green), and the color of the rectangle background region 2 of black and drawn "KS Plan" is R (red). Moreover, the address "Yokohama, Kanagawa" is black to the rectangle background region 2 down side.

[0007] And 2 color image data which shows the multi-colored picture image data shown in drawing 5 (A) to drawing 5 (B) when binary-ization is performed to G (green) component is created. that is, R which is the color of the rectangle background region 2 — R component — receiving — brightness data "FF" (hexadecimal) — having — G and B component — any — brightness data — "00" (hexadecimal) — therefore, it comes out. It is because the brightness data of G component of R which is the color of the rectangle background region 2 are "00" (hexadecimal) when the threshold of the brightness data of G component is set to "55" (hexadecimal).

[0008] That is, it is because it becomes brightness data [of G component of R which is the color of the rectangle background region 2] "00" < "55" (hexadecimal), so R which is the color of the rectangle background region 2 is changed into black by binary-ization.

[0009] Thus, after it was black and the rectangle background region 2 of R (red) of drawn "KS Plan" was changed into black by binary-ization, there was a problem that the alphabetic character "KS Plan" black drawn in the rectangle background region 2 could not be recognized. Although the example of drawing 5 (B) explained the case where the alphabetic character was drawn on the rectangle background region 2, even when the black graphic form is drawn, the problem that the graphic form cannot be recognized similarly occurs. Furthermore, also when the alphabetic character and graphic form of the color near black are drawn on the rectangle background region 2, the same problem occurs.

[0010] This invention was made in view of the above-mentioned point, and the purpose is in offering the image binary-ized equipment which can remove a background color from the multi-colored picture image data which have a background color, and which include the alphabetic character and graphic form of a near color black or black, and can be certainly made binary also including the alphabetic character and graphic form of a near color black or black.

[Translation done.]

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MEANS

[Means for Solving the Problem] In the image binary-ized approach that image binary-ized equipment according to claim 1 changes into binary image data the multi-colored picture image data which have a background color and which include the alphabetic character and graphic form of a near color black or black The 1st binary-ized means which makes binary the whole multi-colored picture image data, and creates 2 color image data, A means to detect the black rectangle field which is a field of the above-mentioned background color from this binary image data, A means to acquire the brightness data of the multi-colored picture image data to this detected rectangle field, The 2nd binary-ized means which searches for binary-ized conditions on that brightness data and a binary-ized information table, makes binary again the multi-colored picture image data which are in a black rectangle field on this binary-ized condition, and obtains 2 color image data, It is characterized by providing a synthetic means to compound 2 color image data for which it asked with the above 1st and the 2nd binary-ized means as one image data.
[0012] As binary-ized conditions over a brightness code, image binary-ized equipment according to claim 2 makes the brightness component notation and binary-ized threshold used as a binary-ized object a brightness code and a group, and is characterized by setting up beforehand at a binary-ized information table according to claim 1.
[0013] In a means to acquire the brightness data of the multi-colored picture image data to a rectangle field according to claim 1, image binary-ized equipment according to claim 3 is characterized by excepting the brightness data from average-value count, when the brightness data to one or more pixels in a rectangle field are acquired first, it considers as brightness data in quest of the average value of these data and brightness data express black.
[0014] Image binary-ized equipment according to claim 4 is set for the 2nd binary-ized means according to claim 1. In case binary-ized conditions are set up, when the brightness code which is in agreement with the acquired brightness data exists in a table with reference to the above-mentioned binary-ized information table The binary-ized conditions corresponding to the code are set up, when the code which is in agreement with a table does not exist, distance count with brightness data and each code of a table etc. is performed, and it asks for a most similar code, and it is characterized by setting up the binary-ized conditions that the code corresponds.
[0015] According to invention, binary-ization of multi-colored picture image data is performed as follows. First, with the 1st binary-ized means, the whole multi-colored picture image data is made binary for the whole image with the threshold of arbitration to one brightness component, and 2 color image data is created. And the coordinate is searched for, when a black rectangle field is detected about 2 color image data and a black rectangle field exists with a means to detect a black rectangle field.
[0016] And from the field of the multi-colored picture image data corresponding to a black rectangle field, the brightness data used as a background color are extracted, and the brightness component notation for binary-izing and binary-ized threshold which are the binary-ized conditions corresponding to the brightness data are acquired and set up with reference to a binary-ized information table. And it is made binary with the 2nd binary-ized means on the binary-ized conditions that the rectangle field corresponding point of multi-colored picture image data was set up. And 2 color image data of a rectangle field part is overwritten to a rectangle field with a synthetic means at 2 color image data of the whole image created at the beginning of processing. In this way, created 2 color image data serves as an image from which the background color was removed.
[0017]
[Embodiment of the Invention] Hereafter, the gestalt of 1 operation of this invention is explained with reference to a drawing.
[0018] Drawing 2 is a block diagram of a computer system with which this image binary-ized equipment is applied. In Fig. 2, the computer system which this invention uses ROM12 which stores the information by which CPU (central processing unit)11 and CPU11 which control the body of a computer control each part (read-only memory), RAM13 which stores the various information for an application program or data processing (random access memory), External memory 14, such as a hard disk which saves data, and the keyboard interface 16 which performs data transmission control with a keyboard 15, The record-medium interface 20 which performs data transmission control with the display controller 18 which controls an indicator 17, and the record media 19, such as a floppy (trademark) disk, It consists of system buses 23 which connect CPU11 and each part 12, 13, 14, 16, 18, 20, and 22 with the image scanner interface 22 which performs data transmission control with an image scanner 21.
[0019] Next, the control-block Fig. for realizing the image binary-ized equipment of this invention with reference to drawing 1 is explained. In drawing 1 to a control section 31 The multi-colored picture image data memorized by the multi-colored picture image file 43 The contents of the image input section 32 to read, the binary-ized section 33

which makes binary the multi-colored picture image data to 2 color image data, the rectangle detecting element 34 which detects a black rectangle field from the 2 color image data, and the binary-ized information table file 44 are referred to. It is made binary. the binary-ized conditioning section 35 which sets up binary-ized conditions — Two or more created 2 color image data The image composition section 36 to compound, the image output section 37 which writes 2 color image data in 2 color image file 45, the multi-colored picture image file 43 which saves multi-colored picture image data, the multi-colored picture image buffer 38 which stores the multi-colored picture image data made into a binary-ized object, and the whole multi-colored picture image data are made binary. Some of all field 2 color image buffers 39 that store created 2 color image data, and multi-colored picture image data are made binary. Created 2 color image data The rectangle field 2 color image buffer 40 to store, the rectangle coordinate buffer 41 which stores the coordinate value of a black rectangle field, the binary-ized condition buffer 42 which stores binary-ized conditions, the binary-ized information table file 44 which saves the binary-ized conditions corresponding to a brightness code, and 2 color image data of a binary-ized result 2 color image file 45 to save is connected.

[0020] Drawing 3 is drawing showing the binary-ized information table memorized by the binary-ized information table file 44. A binary-ized information table is what defined the binary-ized conditions over a brightness code, and the group of a brightness code, the brightness component notation for binary-izing, and a binary-ized threshold is set up. For example, the data set as the table head of drawing 3 express the conditions of making it binary with a threshold 64 (hex decimal), to R (red) component of multi-colored picture image data, when a brightness code is "FF0000" (00 and B component are [R component] 00 for FF and G component) in hex decimal. This binary-ized information table is saved beforehand at the binary-ized information table file 44.

[0021] Next, with reference to the flow chart of drawing 4 , the image binary-ized equipment of this invention is explained. As buffer initialization processing, all the contents of the multi-colored picture image buffer 38, all the field 2 color image buffers 39, the rectangle field 2 color image buffer 40, the rectangle coordinate buffer 41, and the binary-ized condition buffer 42 are eliminated by the control section 31 (step S1).

[0022] Next, the multi-colored picture image data memorized by the multi-colored picture image file 43 are read through the image input section 32, and it is stored in the multi-colored picture image buffer 38 (step S2).

[0023] And the binary-ized section 33 makes binary the data stored in the multi-colored picture image buffer 38 about all pixels, creates 2 color image data, and stores it in all the field 2 color image buffers 39 (step S3). As binary-ized conditions at this time, the brightness component of arbitration and the threshold of the arbitration set up beforehand are used. For example, the image of two colors which the multi-colored picture image showed to drawing 5 (B) when the component for binary-izing was set as G (green) component and binary-ized conditions set a threshold to "55" (hex decimal) by drawing 5 (A) will be stored in all the field 2 color image buffers 39. As shown in all the field 2 color image buffers 39 at drawing 5 (B), the black rectangle field 3 is stored.

[0024] that is, R which is the color of the rectangle background region 2 — R component — receiving — brightness data "FF" (hexadecimal) — having — G and B component — any — brightness data — "00" (hexadecimal) — therefore, it comes out. It is because the brightness data of G component of R which is the color of the rectangle field 2 are "00" (hexadecimal) when the threshold of the brightness data of G component is set to "55" (hexadecimal). Since it becomes brightness data [of G component of R which is the color of the rectangle background region 2] "00" < "55" (hexadecimal), as a result of changing into black R which is the color of the rectangle background region 2 by binary-ization, the black rectangle field 3 occurs.

[0025] Next, the rectangle detecting element 34 detects the black rectangle field 3 black and smeared away to the image data stored in all the field 2 color image buffers 39, (step S4). And when the black rectangle field 3 is detected, the coordinate value is stored in the rectangle coordinate buffer 41. Here, as the detection approach of rectangle distance, there is a method of creating and detecting the histogram of a black pixel, for example. By this approach, a histogram is first created in quest of the sum of the number of black pixels in the horizontal direction of 2 color image data. In this horizontal histogram, the coordinate of the field where many numbers of black pixels continue turns into Y coordinate of the black rectangle field 3. Next, in quest of the sum of the number of black pixels, a histogram is created in the range of the Y coordinate for which it asked with the horizontal histogram in the perpendicular direction of 2 color image data. In this perpendicular direction histogram, the coordinate of the field where many numbers of black pixels continue turns into X coordinate of the black rectangle field 3. In this way, the coordinate searched for turns into a coordinate showing the location of a rectangle field.

[0026] Next, it judges whether there was a black rectangle field 3 detected by step S4 (step S5). And when there is a black rectangle field 3, processing progresses to step S6. When there is no black rectangle field 3, processing progresses to step S10.

[0027] In step S6, the binary-ized conditioning section 35 acquires the brightness data of two or more pixels in the rectangle background region 2 to the image data of the multi-colored picture image buffer 38 based on the coordinate stored in the rectangle coordinate buffer 41. And in quest of the average value of these brightness data, it considers as the brightness data of the rectangle background region 2. That brightness data is excepted from average count noting that it is not brightness data of a background color, when the data showing black are in the acquired brightness data at this time. In this way, the brightness data for which it asked will express the background color of a rectangle field.

[0028] Thus, since the brightness data was excepted from average count for not being brightness data of a background color when the data showing the black which is a part of "KS Plan" were in the acquired brightness data, it can ask for the brightness of the rectangle background region 2 correctly.

[0029] Next, from the brightness data for which it asked at step S6, the binary-ized conditioning section 35 acquires binary-ized conditions with reference to the table of the binary-ized information table file 44, and stores in the binary-ized condition buffer 42. When the brightness data for which it asked at the brightness code and step S6 of a binary-ized information table are compared as the binary-ized condition acquisition approach and there is a code in agreement, the brightness component notation for binary-izing which carries out code correspondence, and a binary-ized threshold are stored in the binary-ized condition buffer 42. On the other hand, when there is no code in agreement, it asks for the nearest brightness code within a table, and the brightness component notation for binary-izing and binary-ized threshold corresponding to the brightness code are stored in the binary-ized condition buffer 42. Here, as an approach of asking for the nearest brightness code, distance with each brightness code in a table is calculated, and there is a method of asking for the brightness code to which the distance becomes the smallest, for example. The following formula is used for distance count.

[0030] (Ri-Rd) 2+(Gi-Gd) 2+(Bi-Bd) 2 -- here, Ri, Gi, and Bi (i= 1, 2, --) are taken as the i-th brightness code R (red) brightness value, G (green) brightness value, and B (blue) brightness value from a binary-ized information table head. Rd, Gd, and Bd are taken as R (red) brightness value of the brightness data for which it asked at step S6, G (green) brightness value, and B (blue) brightness value.

[0031] Thus, since it was made to make the brightness code to which distance with each brightness code in a table is calculated, and the distance becomes the smallest into the brightness of the rectangle background region 2 even when there was no brightness code which is in agreement with the brightness data for which it asked at step S6 in a binary-ized information table, it can ask for the brightness of the rectangle background region 2 correctly.

[0032] In step S8, based on the contents of the rectangle coordinate buffer 41 and the binary-ized condition buffer 42, binary-ization is performed about the pixel in the rectangle background region 2 to the image data of the multi-colored picture image buffer 38 by the binary-ized section 33, and created 2 color image data is stored in the rectangle field 2 color image buffer 40.

[0033] The multi-colored picture image data corresponding to the field of a character string "KS" which turned into a black rectangle field by drawing 5 (B) are made binary, and the created image data is stored in the rectangle field 2 color image buffer 40.

[0034] In step S9, the image composition section 36 overwrites the image data of the rectangle field 2 color image buffer 40 to the image data of all the field 2 color image buffers 39 based on the coordinate value of the rectangle coordinate buffer 41. Consequently, the contents of all the field 2 color image buffers 39 serve as an image shown in drawing 5 (C) after processing of step S9.

[0035] And in step S10, processing whose image output section 37 writes the image data stored in all the field 2 color image buffers 39 in 2 color image file 45 is performed.

[0036] R this image data of whose is the background color of the rectangle background region 2 is removed.

[0037] Thus, even if it is the case in which multi-colored picture image data have a background color where it consists of the alphabetic characters and graphic forms of a near color black or black, binary-ization can remove a background color and 2 color image data which extracted the information on an alphabetic character or a graphic form correctly can be created.

[0038] In addition, although the above-mentioned gestalt of operation explained the case where a black alphabetic character "KS Plan" was in the rectangle background region 2, the background color of the rectangle background region 2 is certainly removable also about the case where a black graphic form, and the alphabetic character and graphic form of the color near black are in the rectangle background region 2.

[Translation done.]